



Appendix C

Traffic Analyses

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TRAFFIC ANALYSIS OF PHASE 2 ALTERNATIVES

Volume Assumptions

The assumption for base (no-build) traffic volumes in the assumed construction year of 2018 are derived directly from the traffic volumes developed in the Champlain Parkway FEIS for the preferred alternative (see Appendix xx).

With a connection from Battery Street to Pine Street, as proposed in any of the Phase 2 Alternatives, traffic is expected to grow a further 3% due to attracted growth for other, more congested streets outside the project area such as St Paul St or US 7.

Future planning year traffic volumes are adjusted from the base volumes as follows:

1. Background growth due to growth in regional and City wide traffic – 2%
2. Growth in the project area due to new development – as estimated in section xx Future Development Traffic
3. Rerouting of traffic within the project area due to the addition of new streets was estimating using a microsimulation model (Transmodeller) which is based on a matrix of traffic zones located outside and within the project area with known origin and destination trips in the peak travel hours. The model determines the best route for trips given the new network of roadways.

Performance Measures

The operational (traffic) performance of the long-term intersection alternatives was assessed in the Transmodeller model, which outputs the following measures:

- Average Intersection delay / Vehicle
- Average delay / vehicle in the network
- Intersection volume / capacity ratio
- Total network travel time
- Total network delay

Projected vehicle delays, levels of service, queues, and volume to capacity ratios (v/c) were assessed for all alternatives during the weekday AM and PM peak hours of travel in 2018 (base year) and 2028 (future year).

Level-of-Service (LOS) is a qualitative measure describing the operating conditions as perceived by motorists driving in a traffic stream. LOS is estimated using the procedures outlined in the 2000 and 2010 Highway Capacity Manuals (HCM) and is based on the average control delay per vehicle. In addition to traffic volumes, key inputs include the number of lanes at each intersection and the traffic signal timing and phasing plans. LOS is graded from LOS A (free flow conditions) to LOS F (congested conditions), and for signalized intersections is based on the estimated average vehicle delay at the intersection—see Figure 26. In urban environments such as the Pine Street corridor, overall intersection LOS D or better is generally considered satisfactory during peak hours of travel. LOS E or F could also be acceptable for locations where facility upgrades could severely impact the

build environment and/or other resources or negatively affect other modes of transportation (e.g., increase pedestrian crossing time due to wider roadway).

FIGURE 1: LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED AND UNSIGNALIZED INTERSECTIONS

LOS	CHARACTERISTICS	UNSIGNALIZED TOTAL DELAY (SEC)	SIGNALIZED TOTAL DELAY (SEC)
A	Little or no delay	≤ 10.0	≤ 10.0
B	Short delays	10.1-15.0	10.1-20.0
C	Average delays	15.1-25.0	20.1-35.0
D	Long delays	25.1-35.0	35.1-55.0
E	Very long delays	35.1-50.0	55.1-80.0
F	Extreme delays	> 50.0	> 80.0

The delay thresholds for LOS at signalized and unsignalized intersections differ because of the driver’s expectations of the operating efficiency for the respective traffic control conditions. According to HCM procedures, an overall LOS cannot be calculated for two-way stop-controlled intersections because not all movements experience delay. In signalized and all-way stop-controlled intersections, all movements experience delay and an overall LOS can be calculated.

LOS results from traffic modeling for each alternative are presented in Table 2. Generally, all build alternatives perform well and alleviate congestion in the no-build condition at the Pine/ Maple intersection, except for Alternative 3 in the future planning year (2035). This congestion is likely due to expected future development traffic and may be mitigated with alternate intersection control.

Traffic Performance Results for each Alternative

TABLE 1. TRAFFIC PERFORMANCE COMPARISON SUMMARY

Alternative: No Build

intersection	2018		2035	
	LOS	Delay	LOS	Delay
Battery/King	B	10	B	11
Battery/Maple	A	8	A	8
Champlain/King	B	12	B	12
Champlain/Maple	B	12	B	13
Pine/King	B	12	B	12
Pine/Maple	E	64	E	73
Pine/Kilburn	A	6	A	6
Pine St/Pine Pl	A	2	A	2
Pine St/Marble Ave	A	2	A	2

Alternative: 1A

intersection	2018		2035	
	LOS	Delay	LOS	Delay
Battery/King	A	9	A	9
Battery/Maple	A	9	B	10
Champlain/King	A	9	A	9
Champlain/Maple	A	8	A	8
Pine/King	A	9	A	10
Pine/Maple	A	10	B	11
Pine/Kilburn	A	3	A	8
Pine St/Pine Pl	A	1	A	7
Pine St/Marble Ave	A	3	B	10
Champlain St/New Road	A	1	A	2
Pine St/New Road	A	1	A	2

Alternative: 1B

intersection	2018		2035	
	LOS	Delay	LOS	Delay
Battery/King	A	9	A	10
Battery/Maple	A	9	A	9
Champlain/King	A	9	A	9
Champlain/Maple	A	8	A	8
Pine/King	A	9	A	10
Pine/Maple	A	10	B	11
Pine/Kilburn	A	3	A	5
Pine St/Pine Pl	A	2	A	9
Pine St/Marble Ave	A	2	A	4
Champlain St/New Road	A	1	A	1
Pine St/New Road	A	1	A	2

Alternative: 2

intersection	2018		2035	
	LOS	Delay	LOS	Delay
Battery/King	A	9	A	10
Battery/Maple	A	9	A	9
Champlain/King	A	9	A	9
Champlain/Maple	A	8	A	8
Pine/King	A	8	A	9
Pine/Maple	B	10	B	12
Pine/Kilburn	A	1	A	2
Pine St/Pine Pl	A	2	A	5
Pine St/Marble Ave	A	0	A	4
Champlain St/New Road	A	1	A	3
Pine St/New Road	A	0	A	1
New Road/New Road	A	0	A	0

Alternative: 3

intersection	2018		2035	
	LOS	Delay	LOS	Delay
Battery/King	A	9	C	28
Battery/Maple	A	9	B	17
Champlain/King	A	9	A	9
Champlain/Maple	A	8	A	8
Pine/King	A	9	A	10
Pine/Maple	B	11	B	12
Pine/Kilburn	A	4	A	5
Pine St/Pine Pl	A	1	A	2
Pine St/Marble Ave	A	3	A	8
Champlain St/New Road	B	12	F	70
Pine St/New Road	A	3	A	4
New Road/New Road				

Alternative: 4

intersection	2018		2035	
	LOS	Delay	LOS	Delay
Battery/King	A	9	B	11
Battery/Maple	A	9	A	10
Champlain/King	A	9	A	10
Champlain/Maple	A	8	A	9
Pine/King	A	9	B	12
Pine/Maple	B	10	B	15
Pine/Kilburn	A	9	B	13
Pine St/Pine Pl	A	2	A	4
Pine St/Marble Ave	B	13	C	17
Champlain St/New Road	A	3	A	8
Pine St/New Road	A	0	A	4
New Road/New Road1	A	0	A	2

Alternative: 5A

intersection	2018		2035	
	LOS	Delay	LOS	Delay
Battery/King	A	9	A	10
Battery/Maple	A	9	A	9
Champlain/King	A	9	A	10
Champlain/Maple	A	8	A	8
Pine/King	A	9	A	10
Pine/Maple	A	10	B	11
Pine/Kilburn	A	3	A	3
Pine St/Pine Pl	A	2	A	2
Pine St/Marble Ave	A	2	A	2
Champlain St/New Road	B	12	B	14
Pine St/New Road	A	1	A	2
New Road/New Road	A	0	A	1

Alternative: 5B

intersection	2018		2035	
	LOS	Delay	LOS	Delay
Battery/King	A	9	A	9
Battery/Maple	A	9	A	9
Champlain/King	A	9	A	9
Champlain/Maple	A	9	A	9
Pine/King	A	10	A	9
Pine/Maple	B	12	B	12
Pine/Kilburn	A	3	A	4
Pine St/Pine Pl	A	3	A	3
Pine St/Marble Ave	A	2	A	2
Champlain St/New Road	A	0	A	0
Pine St/New Road	A	2	A	2
New Road/New Road	A	1	A	1

Figure 27 presents an additional measure of performance, total network delay, which provides more clarity in the ranking of alternatives from a traffic perspective, with Alternatives 1B, 2, 5A and 5B experiencing to least overall delay to vehicles.

FIGURE 2. TOTAL TRAFFIC NETWORK DELAY FOR EACH ALTERNATIVE

